

# BITS

## Burn-in & Test Socket Workshop

# WELCOME



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**Burn-in & Test Socket  
Workshop**

# Technical Program

**Presentation And Panel Discussion**

**Sunday 3/02/03 8:00PM**

## Reducing The Cost Of Test & Burn-in - What Are The Options?

**“Cost Considerations In Burn-In Equipment Development”**

**Anne Sepic - Intel Corporation Dan Weinstein - Intel Corporation**

**Moderator:**

**Fred Taber**

**IBM Microelectronics**

**Panel Members:**

**Ken Heiman**

**Micro Control Company**

**Marc Knox**

**IBM Microelectronics**

**M.S. Maung**

**Advanced Micro Devices**

**Helge Puhmann**

**Yamaichi Electronics Deutschland**

**Steve Strauss**

**Intel Corporation**

**Bob Zacharis**

**Pycon**



## Burn-in & Test Socket Workshop

# Panel Members



**Ken Heiman - Micro  
Control Company**



**M.S. Maung - Advanced  
Micro Devices**



**Helge Puhlmann -  
Yamaichi Electronics  
Deutschland**



**Bob Zacharis -  
Pycon**



**Marc Knox - IBM  
Microelectronics**



**Steve Strauss - Intel  
Corporation**

# **Cost Considerations in Burn-In Equipment Development**

**2003 Burn-in and Test Socket Workshop**

**March 2 - 5, 2003**

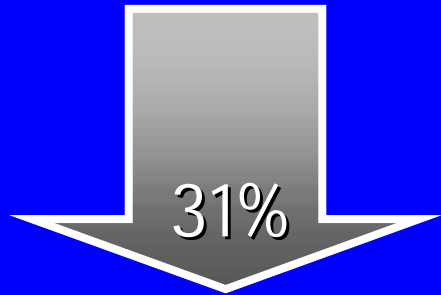
**Anne Sepic & Dan Weinstein  
Capital Equipment Development  
Intel Corporation**



# Agenda

- **Semiconductor Industry Trends**
- **Burn-in trends:**
  - Costs
  - Capability
- **Equipment strategies for lowering total BI cost of ownership:**
  - Equipment architectures to enable high utilization
    - Process considerations
  - Cost drivers and tradeoffs
  - Design for extendibility
  - Design for reliability/maintainability

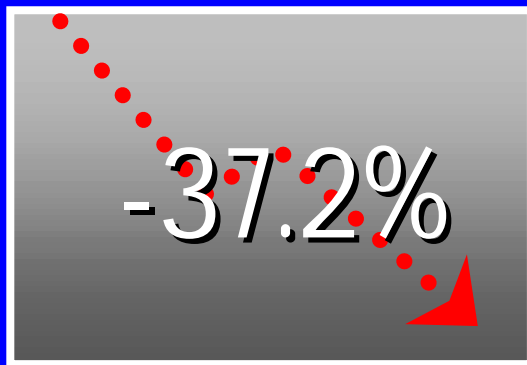
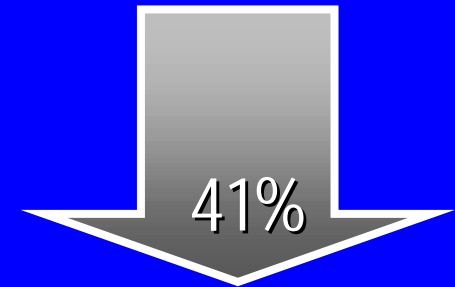
# Semiconductor Revenues



High Tech Job Cuts

740,529

Chip Equipment Revenues

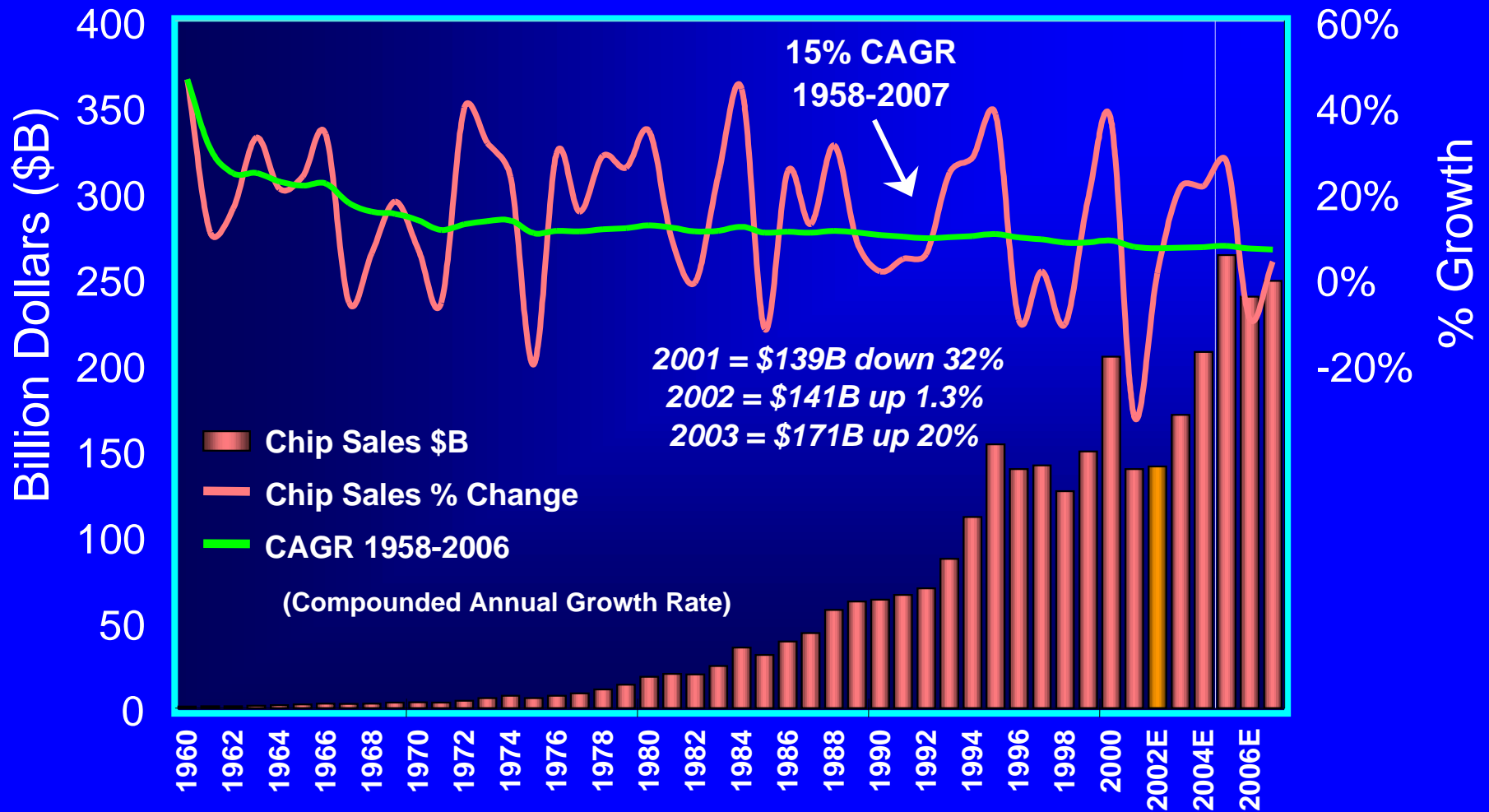


Tech Sector Return

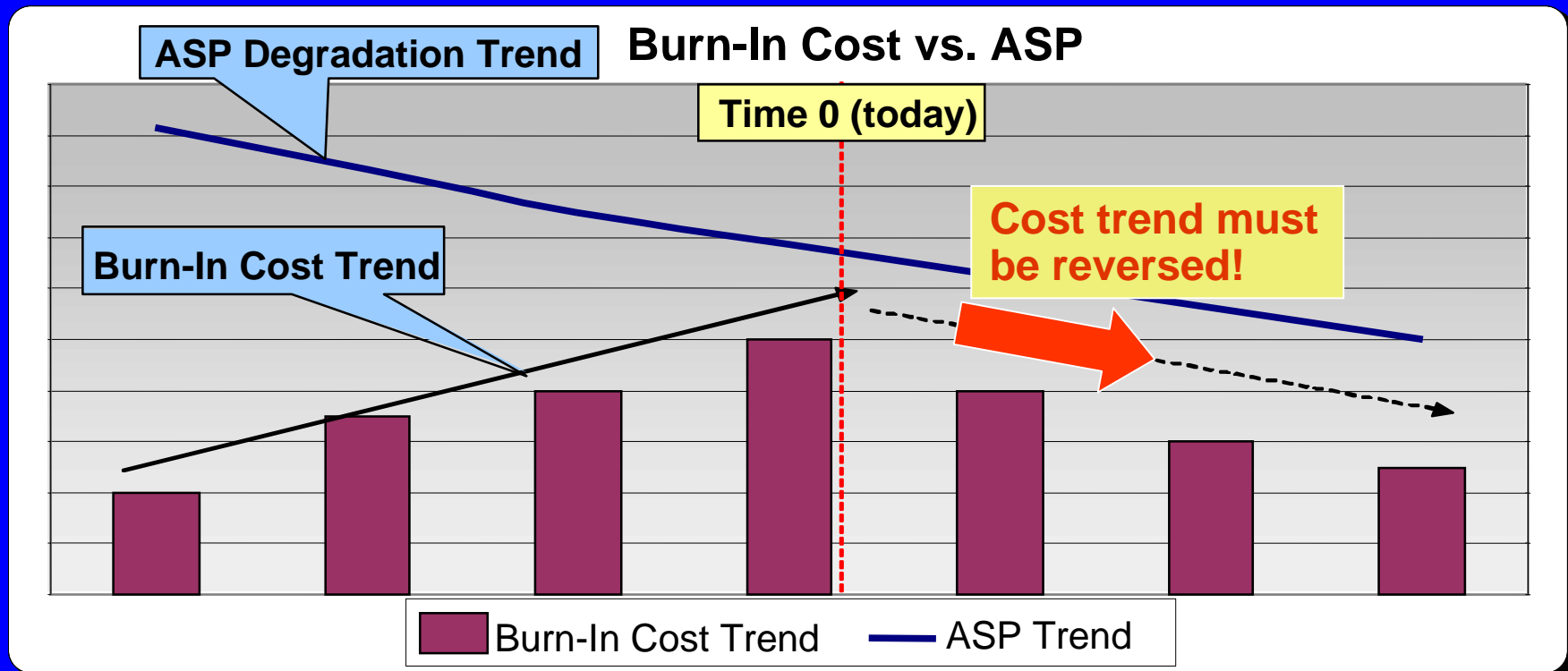
March 2, 2003

Source: VLSI Research

# Semiconductor Industry Cycles

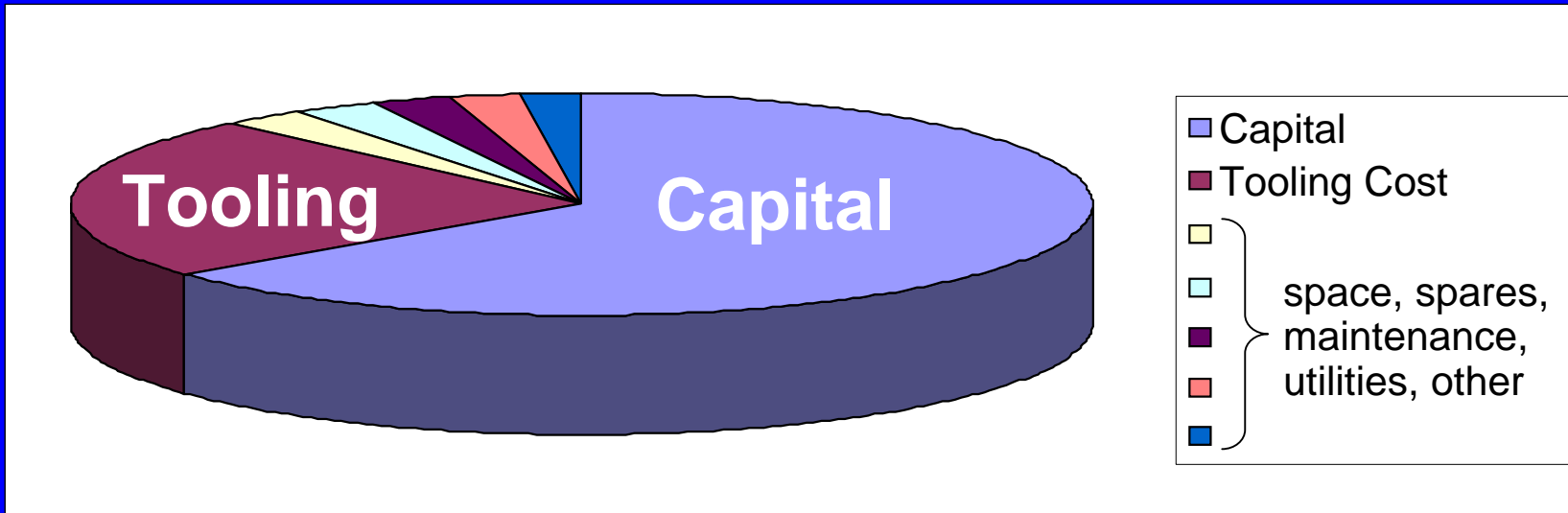


# CPU Cost Trends



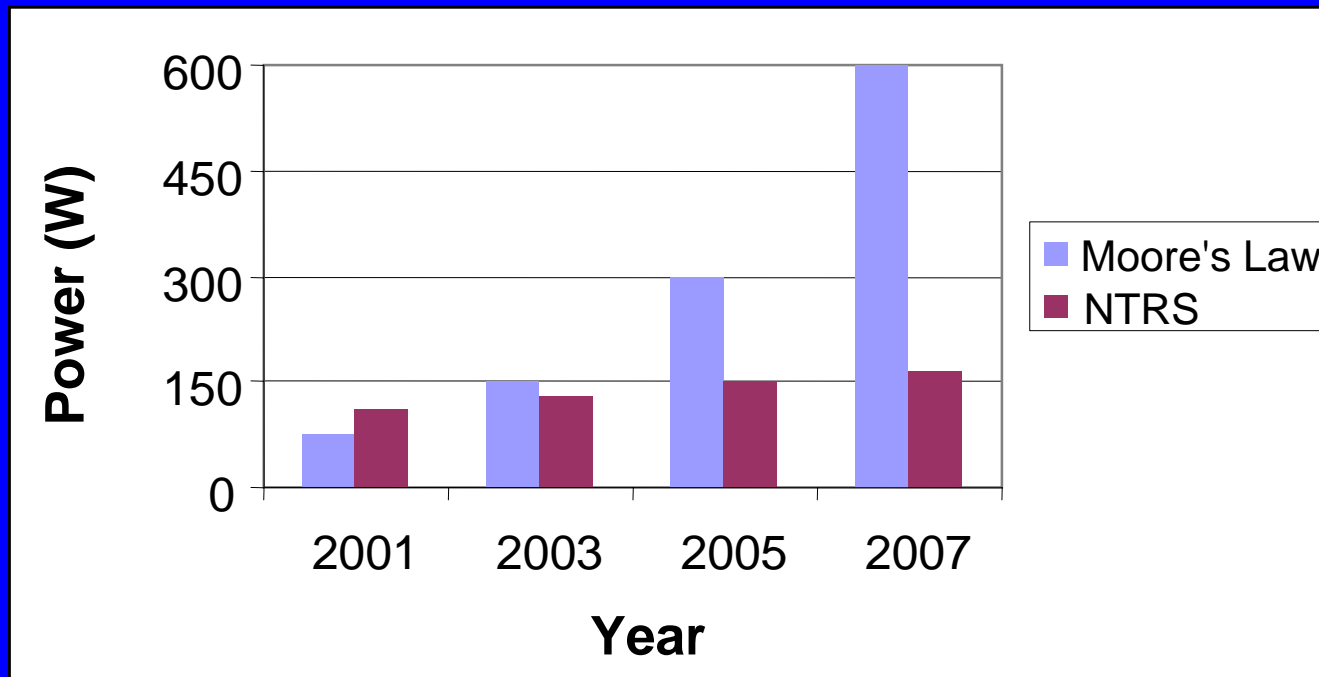
- Margins continue to erode as ASP's decline and competition increases.
- Cost pressures require revolutionary changes
- The supply base must provide a highly capable manufacturing solution at a low cost.

# BI Module Cost Distribution



- Equipment capital cost is by far the largest cost driver.
- Tooling cost is substantial and increases proportionally with *cycle time*.

# Industry Power Trends vs. Moore's Law



- Expect actual power to be in the middle of these prediction extremes.
- Industry will face ever-increasing challenges in power delivery and dissipation

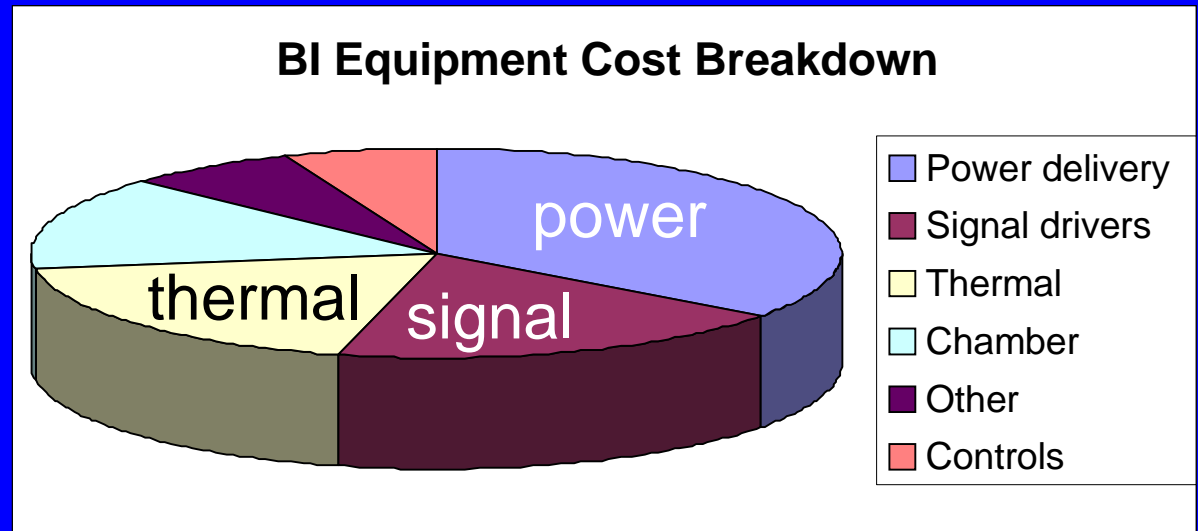
# Equipment Architecture

- **Process cycle time = Cost.**
- **Employ the Lean Manufacturing objectives and methods to reduce individual device non-stress time through process optimization:**
  - Minimize material transfer time.
  - Inter-module: Oven proximity to inline operations.
  - Intra-module: Handler and oven linking.
  - Continuous device feed instead of batch level
  - Reduce burn in boards as 'expensive' device carriers.
- **Burn In equipment must be treated as an integral link in the assembly and test processing chain and the processes which it impacts.**

# Equipment Cost Drivers and Tradeoffs

- **Power delivery:**

- The industry uses custom solutions and interconnects at a high cost.
- Can requirements be adjusted to use lower cost, off the shelf solutions?



- **Thermal capability:**

- Higher power devices on verge of exceeding passive control capability, but active thermal control technology costs too high.
- Breakthroughs in ATC technology are needed to achieve higher capability at costs *less* than passive control.

- **Signal delivery:**

- Precise signal drivers and complicated burn in boards assist in routing signals to the devices.
- Does the evolution in firmware designs change how we test our devices?

# Design for Reliability and Maintainability

- **Reliable equipment costs less.**
  - Minimal efforts to manage spares.
  - Dedicated field service support is not required.
  - Equipment engineering activity reduced.
- **Reliability must be designed up front.**
  - Incorporate input from engineering field work and customer feedback.
- **As complexity and component count increases ? AT&T Reliability Model produces reduced performance indicators.**
  - If components are to fail, ensure maintenance required is simple.

# Design for Extendibility

- **Exponential rise of power requirements requires radical thinking in planning future equipment extensions.**
  - What is requested today runs the risk of being outdated upon introduction.
- **Can the infrastructure to support more power delivery or thermal removal be designed into the system?**
  - With what cost impact?

# Conclusion

- **The increased product power roadmaps and reduced cycle time demands drive the need for burn in equipment development to go through a revolutionary change.**
- **The process architecture and core technology improvements will facilitate a low cost burn in solution.**
- **The industry is not keeping ahead of the capability or cost pressures!**



# System Power Analysis

